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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/621,929	07/16/2003	Enrique Saldivar Guerra	CID001/I-US	8513

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EXAMINER
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LEE, RIP A

ART UNIT	PAPER NUMBER
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1713

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/06/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/621,929	<b>Applicant(s)</b> SALDIVAR GUERRA ET AL.	
	<b>Examiner</b> Rip A. Lee	<b>Art Unit</b> 1713	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 12 January 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-58 and 89-92 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15, 50-52 and 89-92 is/are allowed.
- 6) ☒ Claim(s) 1-14, 17-20, 49 and 53 is/are rejected.
- 7) ☒ Claim(s) 1, 2, 9-11, 14, 16, 17, 19-49 and 53-58 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

This office action follows a request for continued examination (RCE) under 37 § C.F.R. 1.114, filed on January 12, 2007. Claims 15 and 53 were amended. Claims 1-58 and 89-92 are pending. Claims 59-88 have been withdrawn from consideration.

#### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 is drawn to a process of making block copolymer in a single step (line 4), however, the claim recites three active steps of heating (line 2), adjusting (line 5), and recovering (line 7). Therefore, it is unclear *from the claim language*, how the block copolymer is prepared in a single step.<sup>†</sup> Dependent claims 2-14 are subsumed under the rejection.

3. Claims 17-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 17 is drawn to a one-step process for producing block copolymer, however, the claim recited four active steps of heating, adding free radical initiator, adding stable free radical, and recovering. Attention is drawn to dependent claim 19 which states that the process of claim 17 further comprises a step of providing a molar ratio of free radical to initiator. Therefore, it is unclear *from the claim language*, how the block copolymer is prepared in a single step.<sup>†</sup> Dependent claims 18-20 are subsumed under the rejection.

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<sup>†</sup> Recitation that the process utilizes a single *monomer addition* step is suggested to clarify the claim language.

4. Claims 49 and 53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In line 13, it is unclear whether the exit fractional monomer conversion is twice the mass fraction of UCA, larger than the mass fraction of UCA, or equal to or greater than twice the mass fraction of UCA.

### *Claim Objections*

5. Claim 1 is objected to because of the following informalities: In line 2, insert "a mixture of" between "heating" and "styrene" so that there is antecedent basis for the term "the mixture" in dependent claims 9-12. Appropriate correction is required.

6. Claim 1 is objected to because of the following informalities: Please insert "of the block copolymer" between "polydispersity" and "of." This distinction is required since the term could refer to a copolymer block rather than the entire copolymer. Appropriate correction is required.

7. Claim 1 is objected to because of the following informalities: Replace "polymer chain" with "block copolymer." Appropriate correction is required.

8. Claim 2 is objected to because of the following informalities: The term "some degree of" is relative term that renders the claim unclear. It adds nothing to the claim, and the term may be deleted. That the monomers are styrene and unsaturated cyclic anhydride, with inherent reactivity ratios, implies that copolymers thereof will have "some degree of" alternating character. Appropriate correction is required.

9. Claims 9-11 are objected to because of the following informalities: There is insufficient antecedent basis for the term "the mixture" in the claims. Appropriate correction is required.

10. Claim 14 is objected to because of the following informalities: Please use lower case letters for chemical names (except for abbreviation "BPO"), and replace "ter" with "tert." Appropriate correction is required.

11. Claim 16 is objected to because of the following informalities: Replace "polymer chain" with "block copolymer." Appropriate correction is required.

12. Claim 17 is objected to because of the following informalities: In line 7, replace "wherein a desired" with "having a." In line 8, delete "of the block copolymer." In line 9, delete "is." Alternatively, instead of using passive voice, the claim may be written in active voice as,

"manipulating or adjusting or setting the molar ratio of free radical initiator to total monomer in order to recover a block copolymer having a number average molecular weight range of between about 25,000 and about 200,000."

Amendment of the claim in the latter fashion is preferable. Appropriate corrections are required.

13. Claim 19 is objected to because of the following informalities: Replace "further comprising providing" with "wherein." Also, in line 2 of the claim replace "initiator of" with "initiator is." Appropriate correction is required.

14. Claim 20 is objected to because of the following informalities: In line 2, replace "chain" with "block copolymer." Also, delete "desired" in lines 4 and 6. Appropriate correction is required.

15. Claim 21 is objected to because of the following informalities: In line 6, replace "polymer" with "block copolymer," and replace "ranges" with "lies in the range of." Appropriate corrections are required.

16. Claims 22 and 23 are objected to because of the following informalities: It is unclear to what "the pressure" refers. The process is carried out at a particular pressure, but the process does not have a pressure, per se. From the specification, it appears that Applicant is referring to the reactor pressure or the pressure above the reaction mixture. Elucidation and/or appropriate correction is required.

17. Claim 23 is objected to because of the following informalities: The term "equal" is absolute. A pressure is equal to a particular value or it is not. Therefore, it is unclear what is meant by the term "about equal." Appropriate correction is required.

18. Claim 24 is objected to because of the following informalities: Please delete "and/or" and insert "or mixtures thereof" after "ethyl benzene." As written, the solvent appears to be a mixture of all six Markush elements. Appropriate correction is required.

19. Claims 25-30 are objected to because of the following informalities: Please replace "on the basis of the mixture" with "based on the weight." Appropriate correction is required.

20. Claim 31 is objected to because of the following informalities: In line 2, insert "a mixture of" before "styrene." In line 6, replace "in a" with "such that" and replace "initiator of" with "initiator is." In line 8, replace "resulting in a" with "such that the." In line 9, replace "initiator of" with "initiator is." In line 15, replace "un-reacted" with "unreacted." Appropriate corrections are required.

21. Claim 34 is objected to because of the following informalities: The arrangement of elements in the claim does not follow a logical chronology. The following format is suggested:

"A process for producing a block copolymer of styrene and unsaturated cyclic anhydride without a prior step for making a homopolymer from the styrene or the unsaturated cyclic anhydride comprising the steps of: mixing styrene and unsaturated cyclic anhydride in the presence of a solvent; adding a free radical..."

Alternatively, instead of an awkward exclusory limitation, the claim may be written in positive language indicating that a styrene/unsaturated cyclic anhydride block is formed first. Appropriate correction is required.

22. Claim 34 is objected to because of the following informalities: In line 7, replace "in a" with "such that the" and replace "initiator of" with "initiator is." Appropriate corrections are required.

23. Claim 34 is objected to because of the following informalities: In line 11, please rewrite the formula in the same format shown in claim 19. Appropriate correction is required.
24. Claim 35 is objected to because of the following informalities: There appears to be no antecedent basis for the term "reaction mixture." The step of cooling may be omitted from the claim since the essential element of the claim is recovering a block copolymer having a particular molecular weight. Appropriate correction is required.
25. Claim 36 is objected to because of the following informalities: In line 6, replace "in a" with "such that the" and replace "initiator of" with "initiator is." Appropriate correction is required.
26. Claim 36 is objected to because of the following informalities: In line 9, please rewrite the formula in the same format shown in claim 19. Appropriate correction is required.
27. Claim 38 is objected to because of the following informalities: In lines 4 and 9 of the claim, the terms "some" and "some degree of" are relative terms that render the claim vague and indefinite since it is not clear from the claim or the specification how "some" is quantified. The terms may be omitted without altering the subject matter or meaning of the claim. Appropriate corrections are required.
28. Claim 38 is objected to because of the following informalities: Insert "of the block copolymer" between "polydispersity" and "is" and replace "polymer chain" with "block copolymer." Appropriate corrections are required.
29. Claim 45 is objected to because of the following informalities: Please replace "nearly pure" with "essentially pure" as per claim 38. Appropriate correction is required.
30. Claim 49 is objected to because of the following informalities: Insert "(UCA)" after anhydride in line 2. Appropriate correction is required.

31. Claim 53 is objected to because of the following informalities: In line 14, replace “get” with “obtain.” Appropriate correction is required.

32. Claim 54 is objected to because of the following informalities: In line 8, replace “get” with “obtain.” Appropriate correction is required.

33. Claim 55 is objected to because of the following informalities: Please delete “type.” Appropriate correction is required.

34. Claim 56 is objected to because of the following informalities: Please delete “and/or” and insert “or mixtures thereof” after “ethyl benzene.” Appropriate correction is required.

***Allowable Subject Matter/Claim Status***

35. The general subject matter of the claims in this application is patentably distinct over the prior art. The invention is drawn to a process of making block copolymer of styrene and unsaturated cyclic anhydride in the presence of stable free radical and free radical initiator where the block copolymer has a polystyrene block and a poly(styrene/unsaturated cyclic anhydride) block wherein the number average molecular weight is greater than about 25,000. In one aspect of the invention, the copolymer block derived from styrene and unsaturated cyclic anhydride is formed first, and a polystyrene block is formed after the unsaturated cyclic anhydride monomer is essentially depleted.

To date, the closest references are Park *et al.* (*J. Poly. Sci., Part A: Polym. Chem.*, 2000) and Visger *et al.* (U.S. 6,531,547).

Park *et al.* discloses a process of making diblock styrene-styrene/maleic anhydride copolymer by polymerizing monomers in the presence of TEMPO/BPO (1.8 mole ratio; [BPO] = 0.033 M) at a temperature of 120 °C, wherein the wt % of units derived from maleic anhydride lie in the range of 0.2-17.5 wt %. The number average molecular weight of polymers lies in the range of 4,300 to 23,500, and the polydispersity lies in the range of 1.23-1.62. The number average molecular weight lies outside the range recited in the instant claims.



Visger *et al.* discloses a process for making a diblock styrene-styrene/maleic anhydride copolymer by polymerizing monomers in the presence of a mixture of TEMPO /BPO at a temperature between 110-200 °C. In one example, a block copolymer has  $M_n = 22,610$ ,  $M_w = 55,687$ , and  $PDI = 2.46$  (corresponding to approximately 96 styrene or maleic anhydride units) and contains a polystyrene block with  $M_n = 13,423$  and  $M_w = 18,731$  (corresponds to about 138 styrene units),  $PDI = 1.37$ . The product is prepared by formation of a polystyrene block at about 60 to about 70 % conversion, after which maleic anhydride, and optionally, additional styrene is added to the reaction mixture in order to form the styrene/unsaturated cyclic anhydride block. Additional stable free radical and/or free radical initiator may also be introduced to enable the polymerization of the second block to proceed at an appreciable rate. In contrast to the process described by Applicant, the process of Visger *et al.* is set up such that the polystyrene block is formed first, and therefore, polymerization of the entire block copolymer is not performed with a single monomer addition.

The general subject matter of process claims 45-58 is patentably distinct over the closest references, Tanaka *et al.* (U.S. 4,328,327) and Campbell *et al.* (U.S. 6,346,590).

Tanaka *et al.* discloses a continuous bulk polymerization process that is carried out in two stages using a vertical reactor followed by a single-shaft horizontal reactor. The process results in the formation of a uniform copolymer of styrene and maleic anhydride containing a substantially constant amount of maleic anhydride. In sharp contrast, copolymers of the instant invention are block copolymers containing a styrene block and a random styrene/maleic anhydride block.

Campbell *et al.* discloses an apparatus for producing polymers by free radical polymerization and condensation reaction. The reactor is comprised of a primary, continuous stirred tank reactor which is connected in series to a secondary tube reactor. The reference does not disclose use of this configuration to make the polymer of the instant claims. Since the polymer of the prior art is prepared by free radical and condensation means, it would not have been obvious to one having ordinary skill in the art to use this apparatus for making the polymers of the instant claims.

36. The status of claims is as follows:

Claims 1-14, 17-20, 49 and 53 are rejected under 35 U.S.C. 112, 2<sup>nd</sup> paragraph.

Claims 1, 2, 9-11, 14, 16, 17, 19-31, 34-36, 38, 45, 49, and 53-56 were objected to for matters of form which are readily correctable by amendment.

Claims 15, 50-52, and 89-92 are in suitable condition for allowance.

Although claims 32, 33, 37, 39-44, 46-48, 57, and 58 contain no errors, for purposes of completing PTO-326, they are listed as being "objected to" because they depend from objected independent claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rip A. Lee whose telephone number is (571)272-1104. The examiner can be reached on Monday through Friday from 9:00 AM - 5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached at (571)272-1114. The fax phone number for the organization where this application or proceeding is assigned is (571)273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <<http://pair-direct.uspto.gov>>. Should you have questions on the access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).



March 30, 2007